

24 March 2003  
Application N .09/833,139  
Docket: 1058

**b.) Remarks**

Claims 1 through 20 are pending in this application.

Claim 1 was rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter not described in the specification. Specifically, the claim was criticized for reciting a mathematical equation containing the variable  $V_r$ . It was stated that the specification failed to define this variable.

Applicant respectfully requests clarification of this rejection. The variable  $V_r$  is defined. In fact, it is defined in claim 1 since definition for this variable is provided directly in the claim. Moreover, contrary to the assertion of the Office Action that the specification failed to define the variable  $V_r$ , the variable is defined in the specification at page 20, equation 12.

Thus, Applicant does not understand this rejection. Clarification is respectfully requested.

Claims 1 through 20 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

Specifically, relative to claim 1, it was stated that, since the claim recites a mathematical algorithm, it was not clear whether the invention represented a design choice or an invention that is under experimentation.

This basis for the rejection is not understood. The fact that the invention may involve design choices or is/has been the subject of experimentation would not seem to impact whether the words of the claim are clear, or not. In short, it is not understood how a claim could be rendered indefinite because the inventor may be performing experiments. Clarification is requested.

In fact, the present invention is directed to the design of the optical resonator cavity mirrors and/or intracavity lenses. The design intention for these mirrors/lenses is

24 March 2003.  
Application No.09/833,139  
Docket: 1058

to degrade the ability of the resonator to support higher order transverse spatial modes. Higher order transverse modes are forced to be unstable in the inventive optical resonator, ultimately achieving improved transverse mode operation to single transverse mode resonator operation. These characteristics can be generally bounded by the equation of claim 1, for example. This equation specifically relates 1) the sag of a net mirror profile of the mirror structures, 2) a full width at half maximum (FWHM) diameter of the net mirror profile of the mirror structures, 3) the refractive index of the optical cavity, 3) the wavelength of operation, and 4) the length of the optical cavity. It is not understood how this description could be indefinite.

With respect to claim 7, the phrases "mirror structure" and "the ratio of the mode  $1/e^2$ " where identified as unclear in the Office Action. The Office Action stated that it was unclear what the "mirror structure" and "the ratio of the mode  $1/e^2$ " are.

These features, however, are described in the specification and claims. For example, MEMS implementations of the mirror structures are described with reference to Fig. 33, in detail. The  $1/e^2$  intensity is simply a way of characterizing the size of the mode relative to the size of the mirror structure. Thus, Applicant does not understand how these terms could be unclear since specific support is found in the specification and they are common within the industry.

Regarding the rejection of claim 12, the phrases "mirror structure" and "selected in combination with a length of the cavity to degrade a stability of transverse modes with mode numbers 4 and greater" were identified as indefinite. The Office Action argued that they provided no structural limitations to the "mirror structure".

Applicant respectfully disagrees. The claim requires that "at least one of the mirror structures has a mirror profile having a diameter and sag selected in combination with a length of the cavity to degrade a stability of transverse modes with mode numbers 4 and greater". Thus, specific characteristics of the structures are defined in terms of their size and sag.

24 March 2003  
Application No.09/833,139  
Docket: 1058

The Office Action also questions the meaning of "mode number" and "transverse mode". The modes with different number or order, however, are actually shown in the present application in Fig. 3A-3F.

Finally, it was questioned to which figure claim 20 relates. Reference is made to Fig. 36C, which shows one example.

For the foregoing reasons, Applicant believes that the present claim invention is clear.

Claims 1 through 6 and 12 through 20 were rejected under 35 U.S.C. § 102(b), as being anticipated by U.S. Pat. No. 5,418,641, to Hendow, et al. In a related rejection, Claims 7 through 11 were rejected under U.S.C. § 103(a), as being unpatentable over the Hendow, et al. patent in view of U.S. Pat. No. 6,393,035 to Weingarten, et al. These rejections are respectfully traversed for the following reasons.

The Hendow, et al. patent understands the problem associated with the higher order modes. It takes a different approach to addressing the existence of these modes, however. Specifically, it suggests minimizing the effect of these higher order modes by merging the families of transverse modes into the longitudinal TEM00 mode. This is accomplished by using mirrors with very long focal lengths. See for example Hendrow at Col 8, lines 11-19.

In contrast, the present invention minimizes these modes by making these optical modes unstable in the resonator, rather than merging them. This is done by controlling the sag and diameter of the mirror structures, along with the length of the optical cavity. This relationship is not appreciated by the applied reference.

Moreover, the cited reference further fails to understand the relevance of the mirror structure diameter, which is not mentioned.

In short, where Hendow, et al. teach to tolerate but merge the higher order modes, the present claimed invention is directed at their suppression.

24 March 2003  
Application No.09/833,139  
Docket: 1058

The Weingarten, et al. reference was simply cited for the disclosure of a dielectric mirror, but otherwise provides no teaching concerning the invention described in claim 1, and specifically higher order mode suppression. Thus, Applicant believes that this combination also fails to show or suggest the present claimed invention.

For the foregoing reasons, the present claimed invention is distinguishable over the applied references. Withdrawal of the rejections is requested.

Applicant believes that the present application is in condition for allowance. A Notice of Allowance is respectfully solicited. Should any questions arise, the Examiner is encouraged to contact the undersigned.

Respectfully submitted,

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